

Development of an algorithm for the evaluation of gait and balance impairments in CNS disorders

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SUBMISSION DETAILS

What is the Methodological Question Being Addressed? Can a sensor-based digital biomarker be used to measure gait and balance in patients with CNS disorders?

Introduction Gait and balance impairments are present across a broad range of CNS disorders, including in patients with movement disorders, dementias, and psychotic disorders such as schizophrenia. Traditional clinical measures of gait impairment rely on clinician raters or timed performance tests with high variability. A digital biomarker for measuring gait and balance impairments can be used to evaluate change over time in gait features such as stride period, walking speed, and step counts. Previous studies have demonstrated that smartphone-based tools can be used to measure gait and balance.

Methods An iPhone application was developed to measure gait features using accelerometers. The application was designed to collect performance data from a timed walk test in an office space. 11 healthy subjects walked a measured course for each of 5, 10, 15 and 20 second observation periods. Raters timed the walking test using a stopwatch, and 2 raters recorded step count and distance walked. The application and algorithm derived the duration, distance, speed, step count, and stride period.

Results The study dataset comprised 83 completed assessments. Intraclass Correlation Coefficient (ICC) for agreement between the application algorithm and rater measures was calculated. Subjects were required to complete at least 2 attempts, and subject compliance was 80%. The smartphone assessment and algorithm measures demonstrate ICC > 0.9 for duration, distance and step count compared with “gold standard” rater measures. Placing the iPhone 8 plus in a shoulder bag or loose pocket over a fixed duration 20 second walk results in ICC > 0.8 for distance, step count and stride period.

Conclusion The evaluation of gait and balance impairments in clinical research is typically done using clinician rating scales or timed performance tests. The use of a smartphone-based gait and balance measure could allow for expanded evaluation of performance capacity, including the use of repeated or continuous measurement of gait for patients at home or unable to visit clinical trial sites. This tool may be useful as a trial enrichment tool or as a digital endpoint.

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Keywords

| Keywords |
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Guidelines I have read and understand the Poster Guidelines

Disclosures if applicable The authors are employees of Koneksa, who supported this study.

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